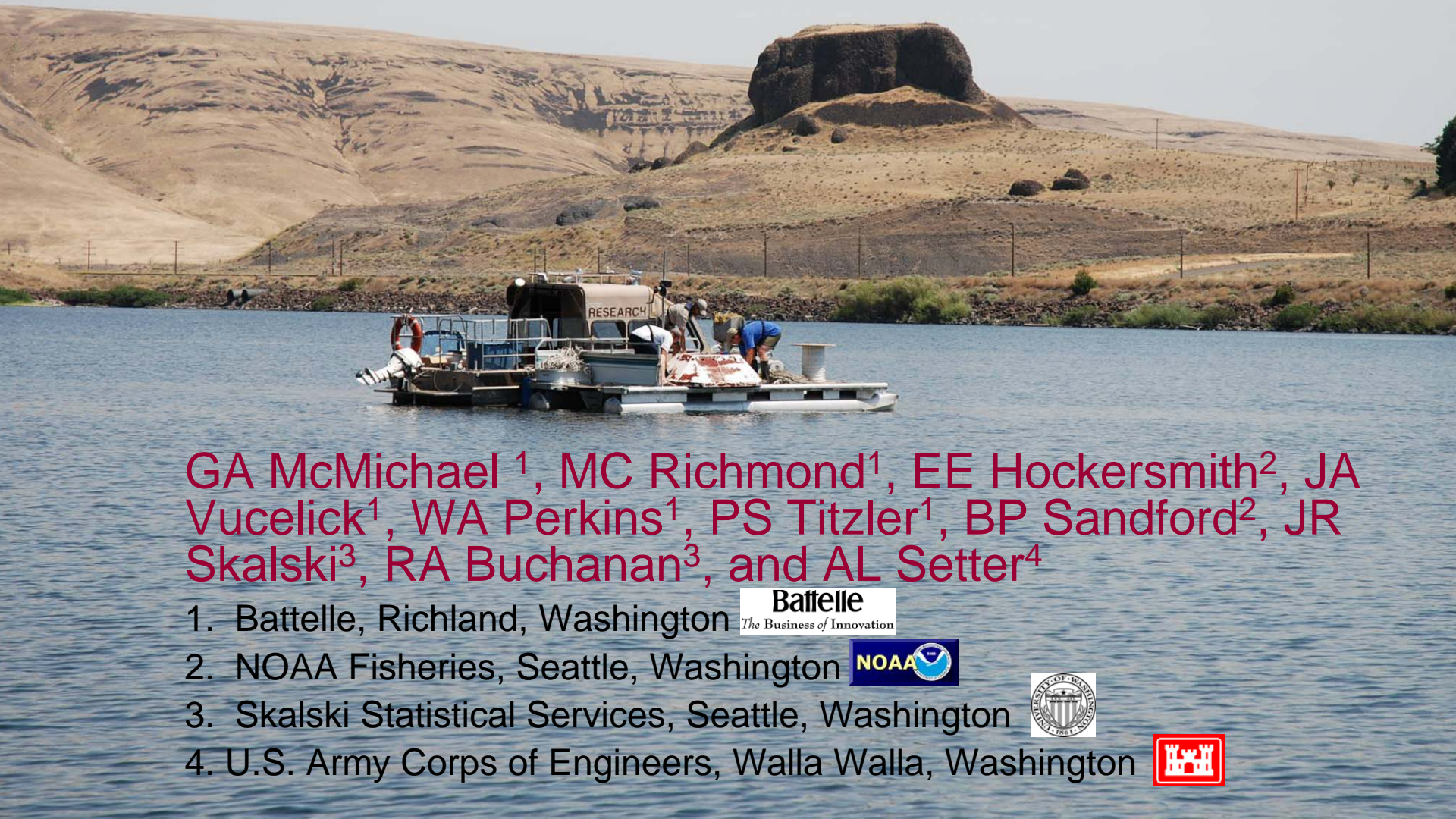


Migratory Behavior of Subyearling Chinook Salmon in Lower Monumental Reservoir



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1. Battelle, Richland, Washington
2. NOAA Fisheries, Seattle, Washington
3. Skalski Statistical Services, Seattle, Washington
4. U.S. Army Corps of Engineers, Walla Walla, Washington



Background

- ▶ NOAA Project 2005 (Absolon, Hockersmith, et al.)
 - released 1,103 RT subyearling Chinook 6 km upstream of Lower Monumental (LMN) Dam July 6-16
 - 45% of released not detected by any of the downstream arrays
- ▶ Battelle/NOAA Project 2006 (Cook et al. 2007)
 - Released 1,949 subyearling Chinook in Little Goose (LGO) tailrace June 16-July 19
 - 44% of released not detected downstream of the reservoir
 - Most fish stopped in lower half of reservoir where water was stratified

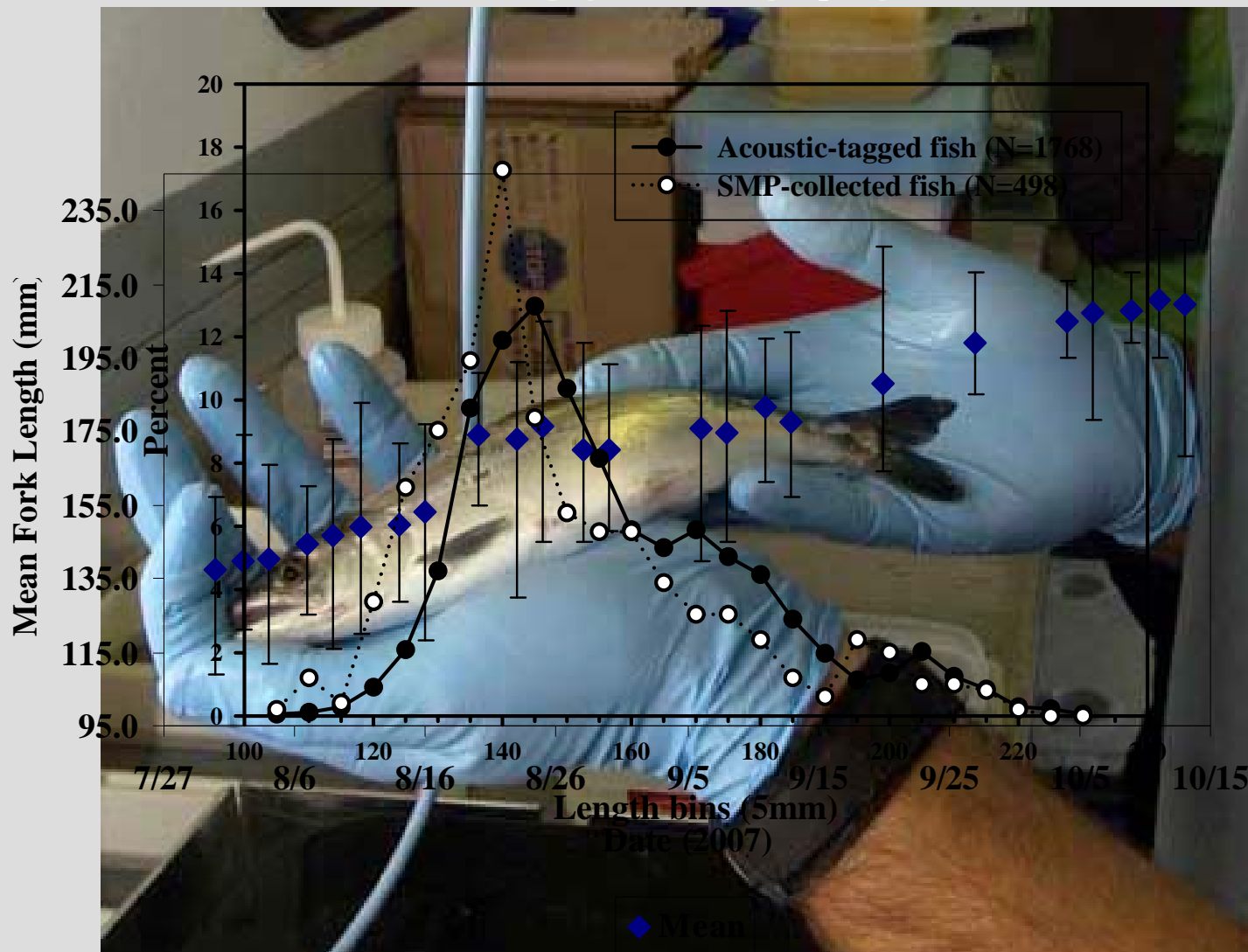
2007 Study Objectives

- ▶ For subyearling Chinook salmon released in the upper end of LMN Reservoir, determine;
 - Emigration rate
 - Extent of movement
 - Relationship to predator fish movement
 - Probability of movement and survival
- ▶ Collect hydrodynamic information
 - For discerning relationships between fish movement and hydrodynamics
- ▶ Examine ATPase levels as they may relate to migratory behavior
- ▶ Examine directional movement patterns in relation to project operations

Fish Releases

- ▶ Run-of-river subyearling Chinook salmon collected and tagged at Little Goose Dam Juvenile Fish Facility
 - 1,771 subyearlings released July 31 through October 13
- ▶ All acoustic transmitters were JSATS 55-day Sonic Concepts tags (0.6 g in air) [body burden~0.55 to 1.5%]
- ▶ Predator fish collected by angling and tagged in lower 10 km or LMN reservoir
 - July 26-27 = 100 smallmouth bass (SMB)
 - September 19-20 = 96 SMB, 3 channel catfish, 1 northern pikeminnow

Subyearlings were large in late summer/fall



ATPase Data Collection

- ▶ 1,589 gill tissue samples collected
- ▶ Delivered to NOAA-Seattle for analyses in late October 2007
- ▶ Analyses ongoing



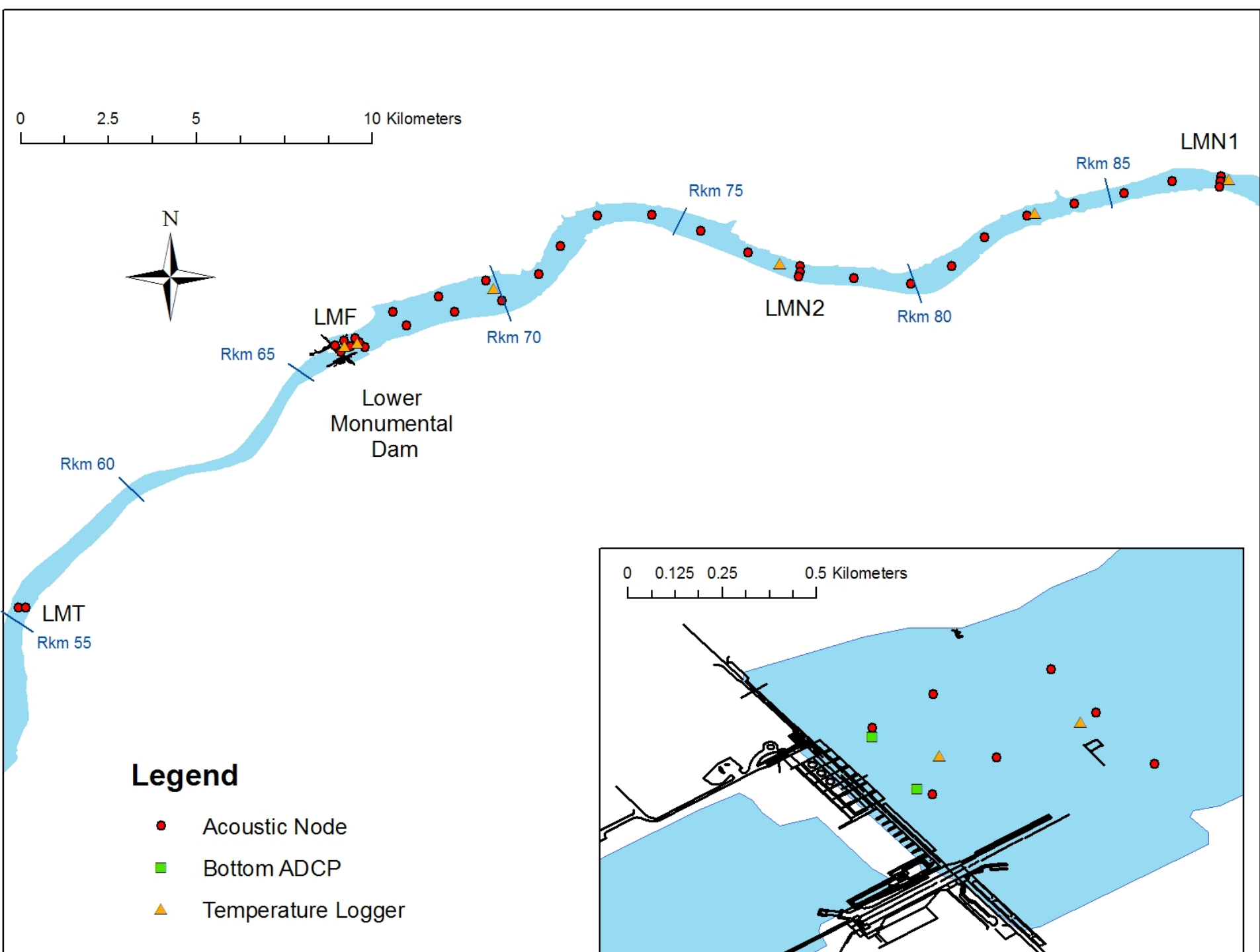
Acoustic Receiver Deployment

- ▶ 33 JSATS autonomous receivers
 - 7 in immediate LMN forebay
 - 26 in 1 km increments upstream to 22 km upstream of LMN Dam (LGO = 46 km upstream from LMN)
 - Deployed before July 31 – present (removal ~Dec. 14)
 - Data Download ~ every 14 days (except those in BRZ)

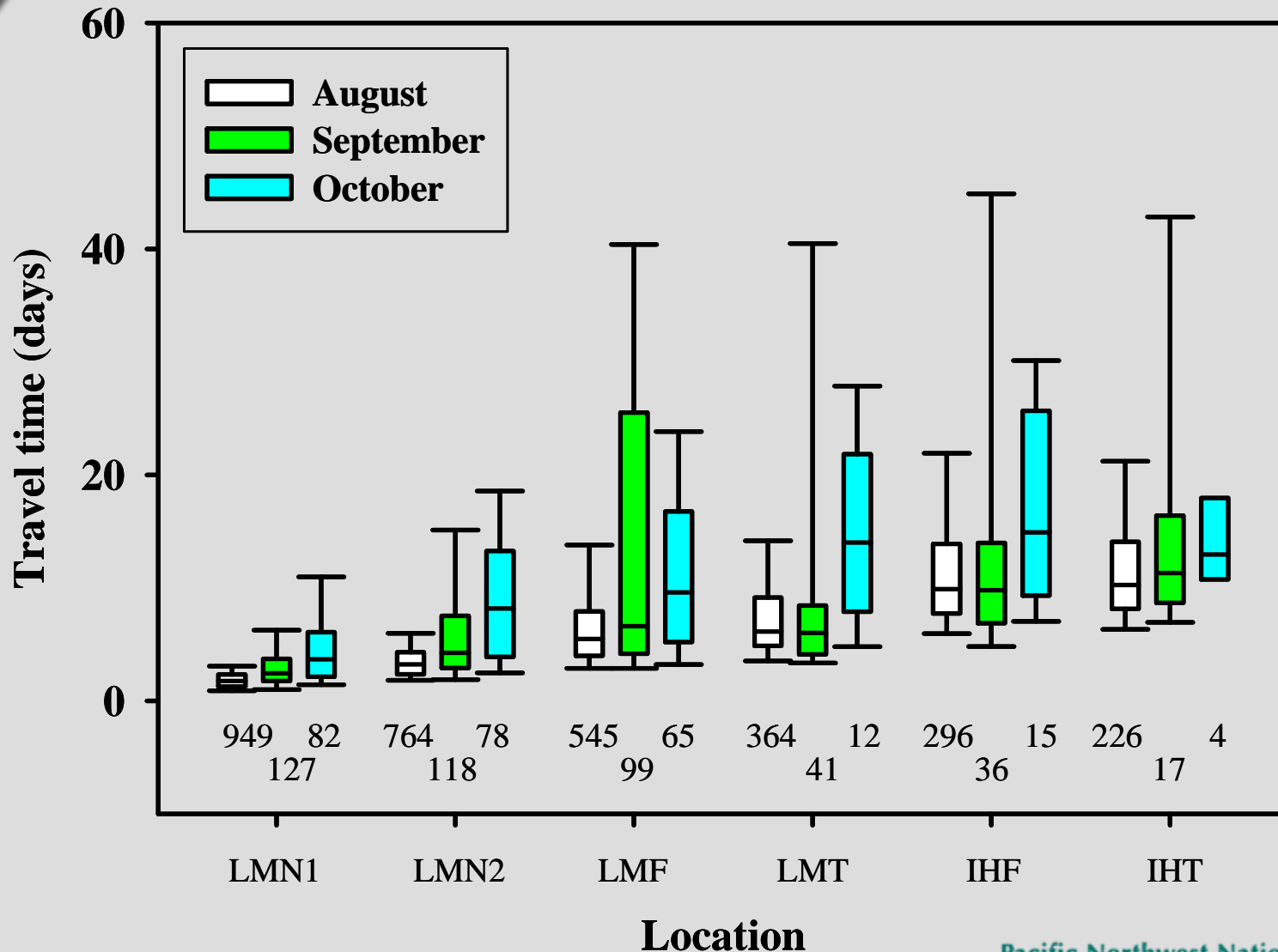


Water Temperature and Velocity Equipment Deployment

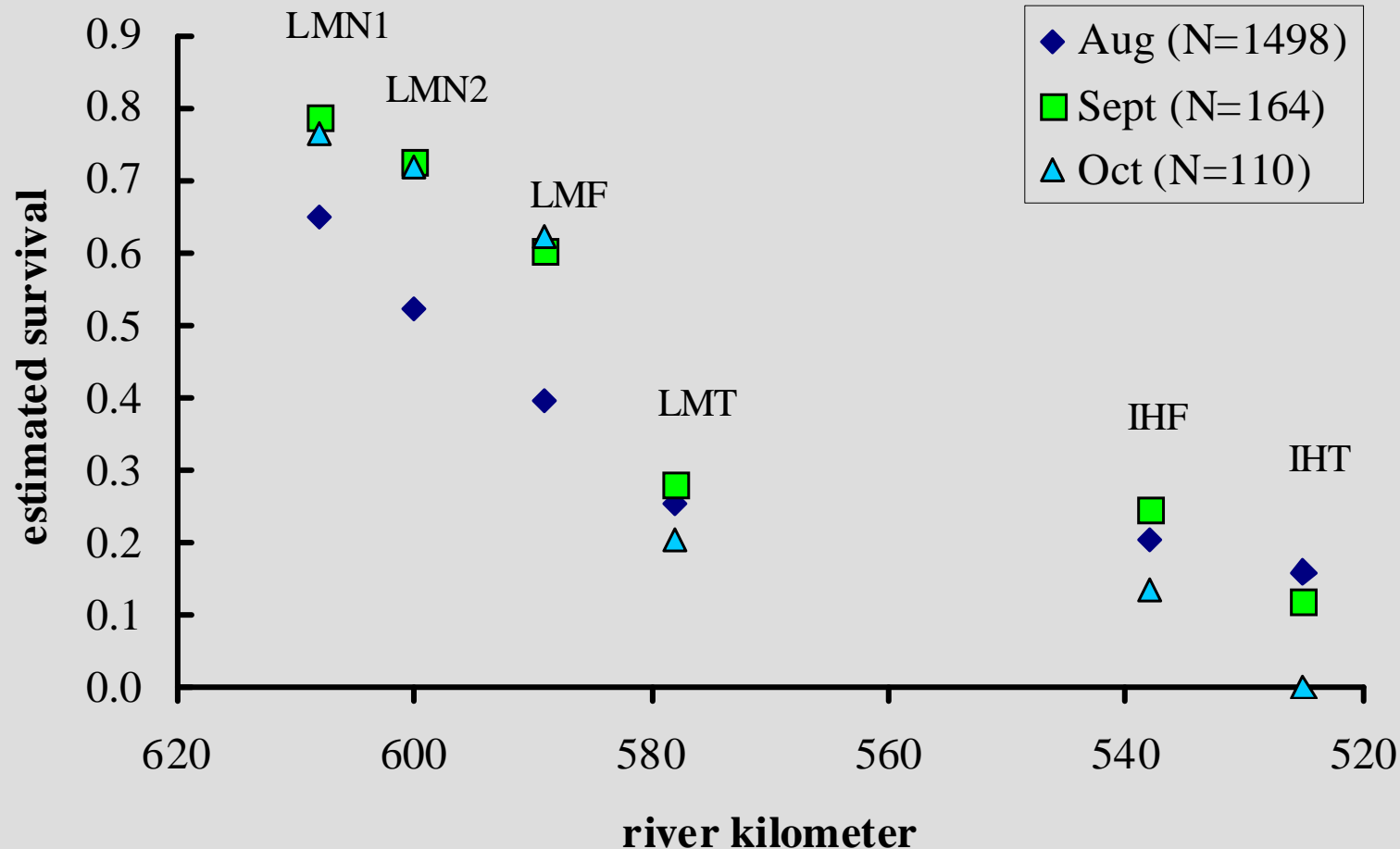
- ▶ Water Temperature (10-min data)
 - 77 temperature loggers deployed at 5 sites.
- ▶ 3-D Water Velocity Profiles (2-min data)
 - 2 self-contained ADCPs
 - vertical resolution = 0.5 m bins
 - bottom-mounted within forebay BRZ
- ▶ Reservoir Mobile Surveys (monthly)
 - boat mounted ADCP
 - conductivity-temperature-depth (CTD) profiles



Subyearling Chinook travel times generally increased later in the season

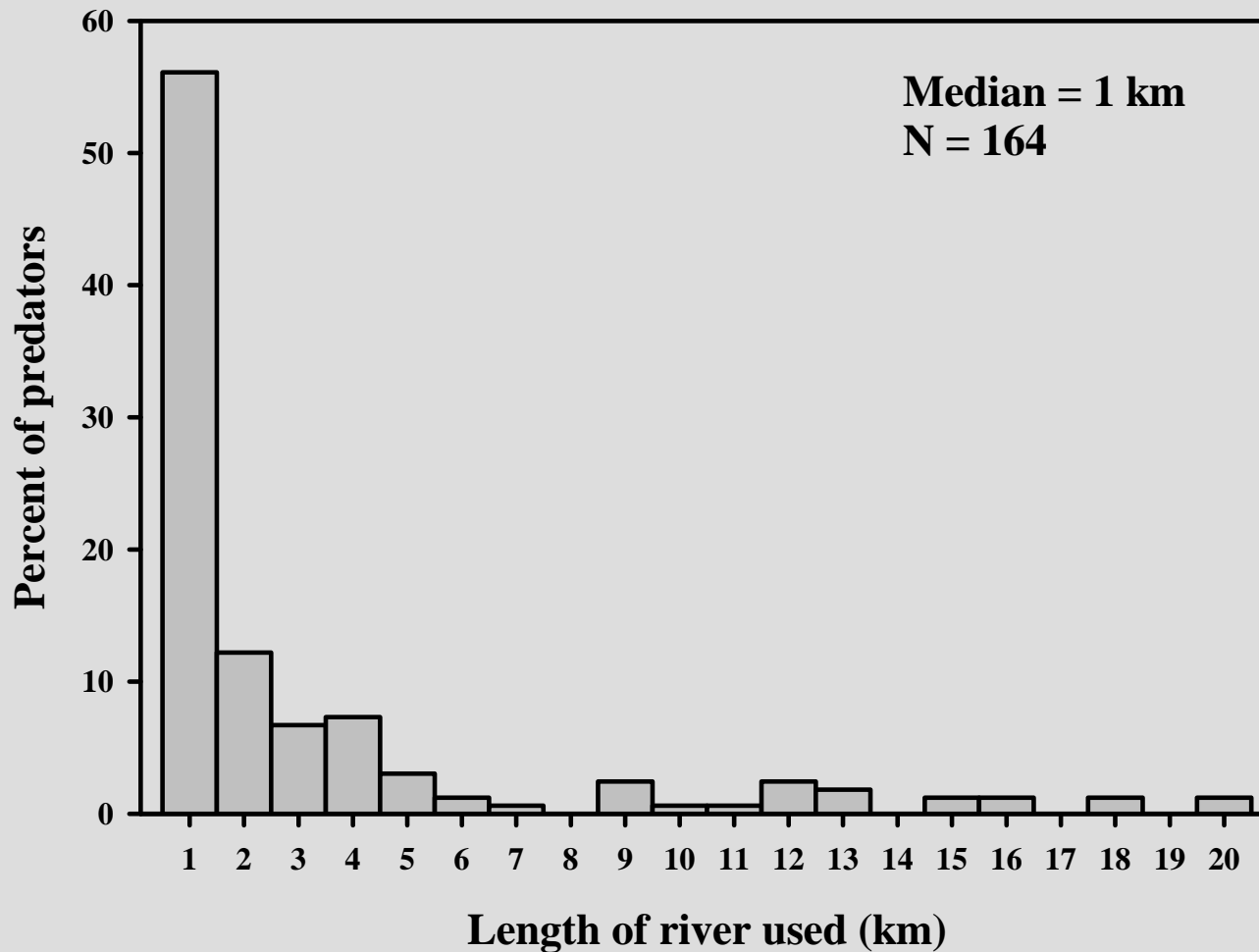


Probability of Movement and Survival* was higher within LMN Pool in Sept and October

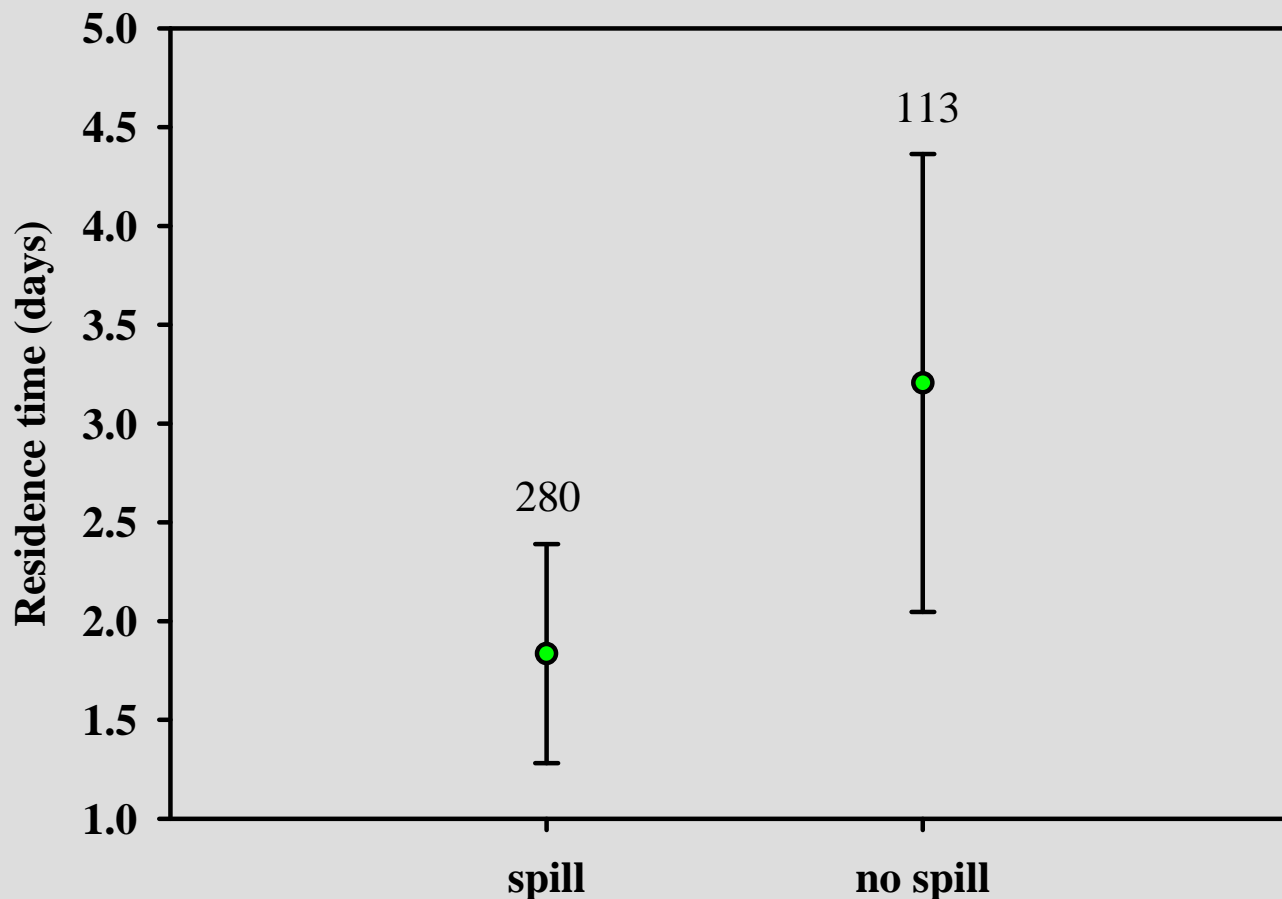


* Preliminary estimates; final estimates will be calculated by Skalski and Buchanan

Predator movement was limited

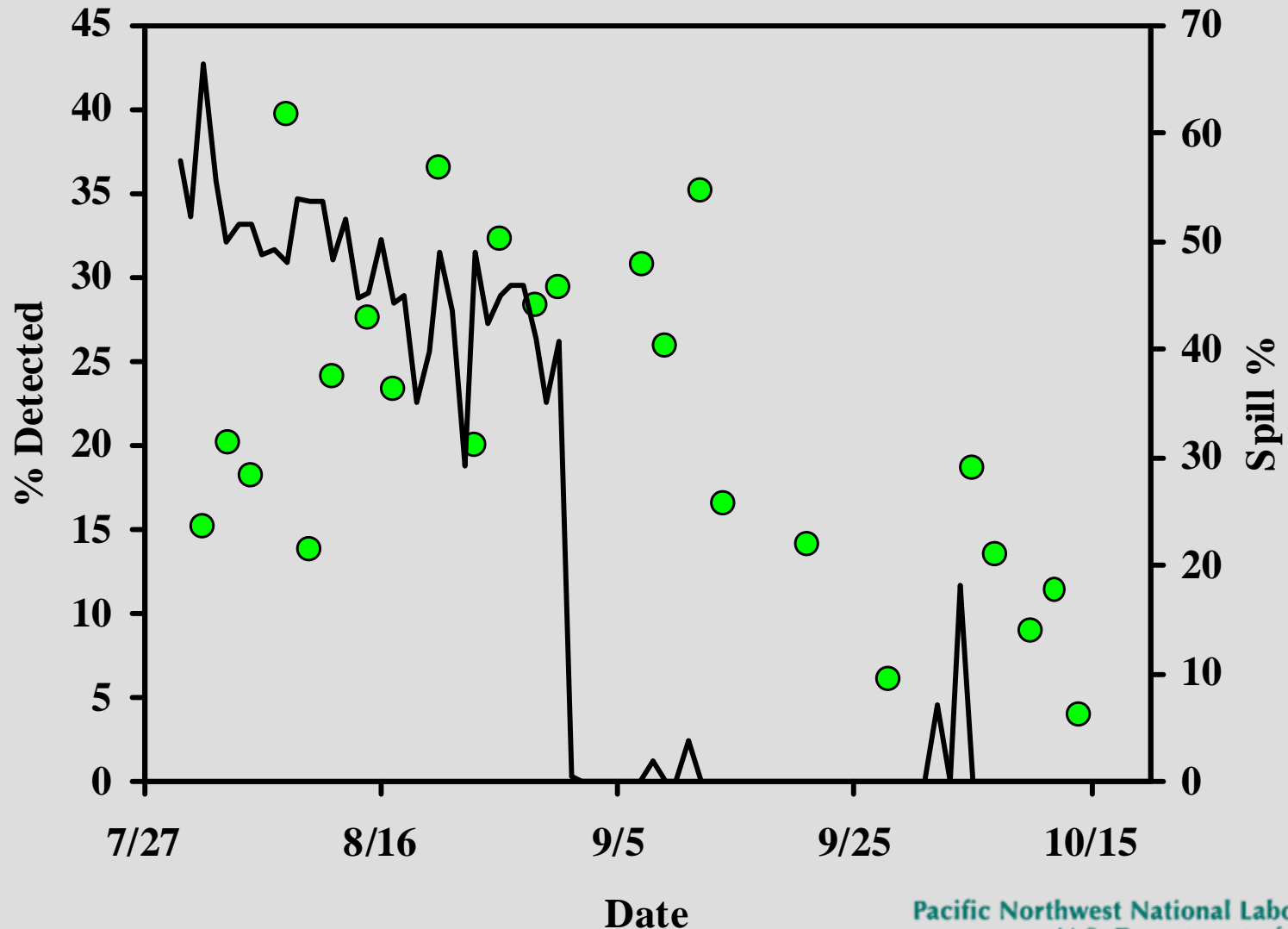


Residence time* increased in LMN forebay after spill ceased

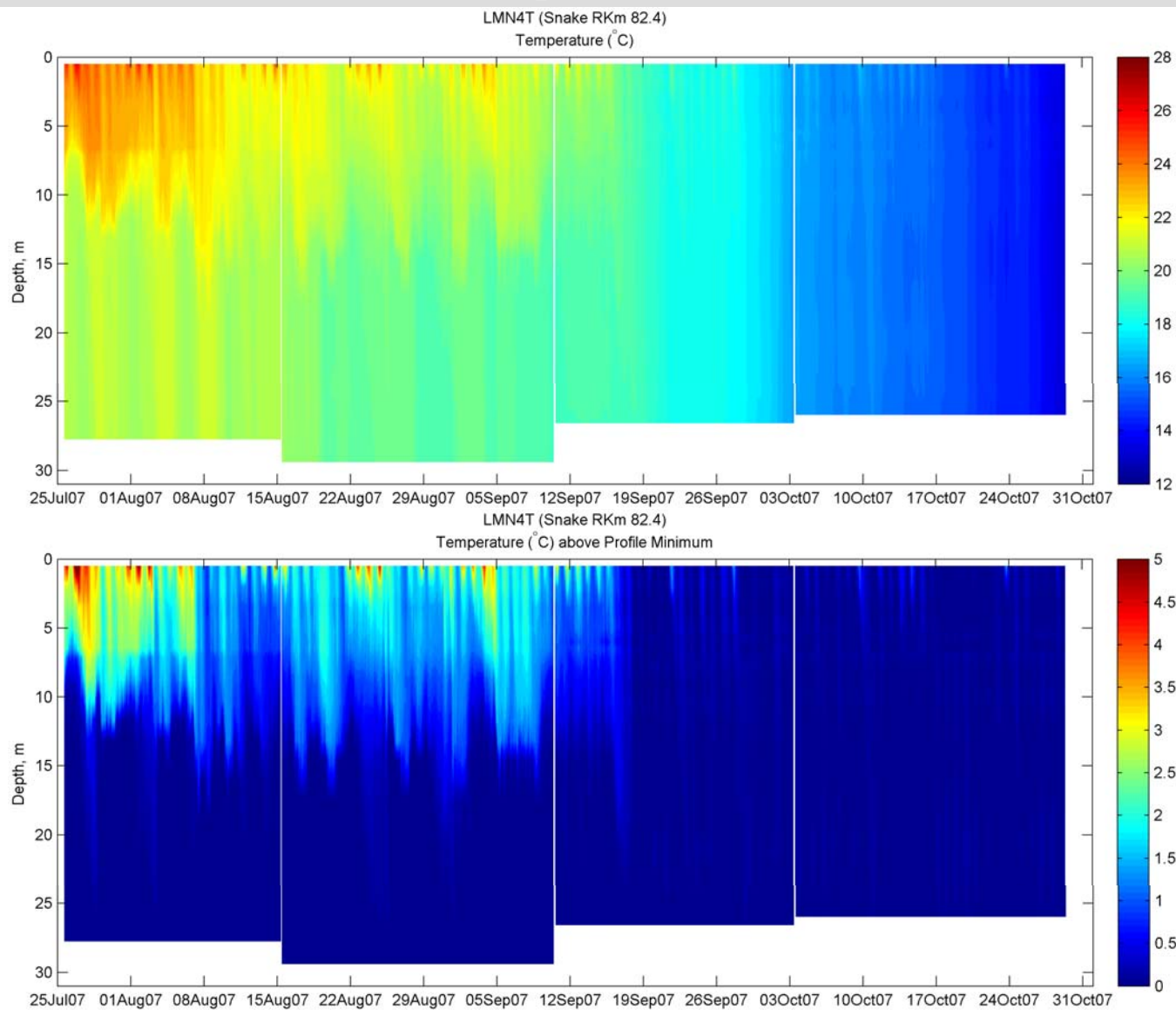


*Mean \pm 1.96 SE for first detect at forebay to first detect at tailrace

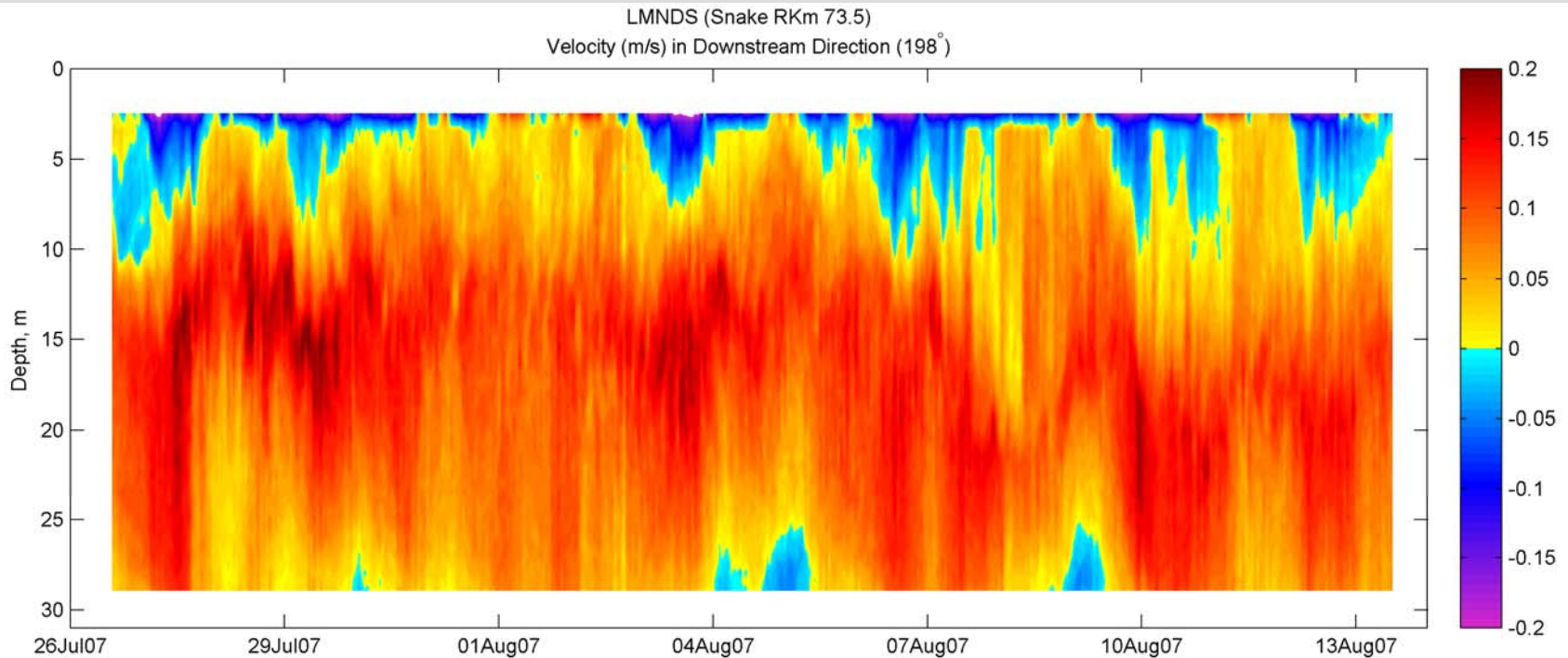
Percent detected downstream of LMN varied throughout the study period



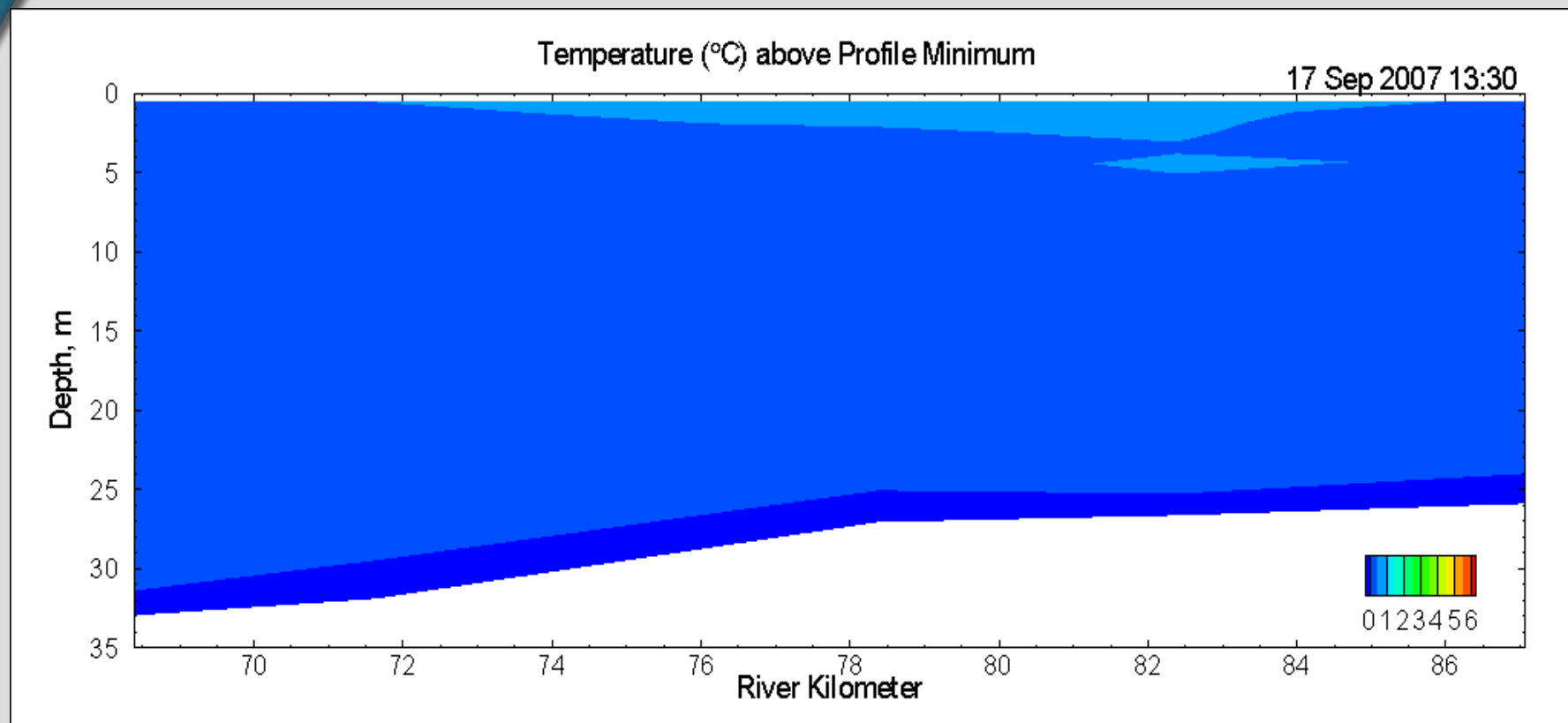
Vertical Temperature Variation



Flow Reversals in August



Thermal Layer Breakup



Conclusions

- ▶ Data Collection – ongoing
 - Acoustic receivers and hydraulic/temperature sensors to be recovered ~ December 14
- ▶ Data Processing/Analyses – ongoing
 - ATPase samples being analyzed (NOAA-Seattle)
 - Fish detection histories being analyzed (UW-Seattle and Battelle-Richland)
- ▶ Reporting
 - Draft expected in June 2008

Management Implications

- ▶ Too early to speculate too much...
- ▶ Expected results
 - Late season subyearling emigration rates over time
 - Distribution and behavior of extended-rearing Chinook
 - Relationships between Chinook and predator movement
 - Baseline information prior to operation of RSW
 - Forebay movement patterns
 - Forebay residence times
 - Timing of dam passage
 - Probability of movement and survival
 - In relation to reservoir conditions
 - In relation to project operations
 - In relation to other biological factors
 - ATPase
 - Fish length
 - Relationship between reservoir hydrodynamics and fish movement
 - Relationship between LMN operations and reservoir hydrodynamics

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